DOCUMENT RESUME

ED 158 419 EA 010 847

AUTHOR Gump, Paul; Ross, Rhonda
TITLE What's Happened in Schools of Open Design? (A Report to Cooperating Staff.)
PUB DATE [78]
NOTE 35p.

EDRS PRICE MF-$0.83 HC-$2.06 Plus Postage.
DESCRIPTORS Evaluation Methods; *Measurement Techniques; *Open Education; *Open Plan Schools; Statistical Data; Tables (Data); Teacher Attitudes
IDENTIFIERS *Kansas

ABSTRACT

Twenty-one elementary schools of "open space" design were studied to learn how teachers were adapting to this new kind of school environment. A method of quantifying a building's extent of physical openness was developed. Comparison of the original design of the buildings with their current floorplan indicated that in all but four of the schools the original openness had been considerably reduced by closing folding partitions, placing tall furniture between teaching areas, and, in extreme cases, by building new interior walls. Program openness was quantified by collecting information from teachers with respect to the extent that they dealt with a variety of students, the amount of team teaching that occurred, the degree to which groups from various areas were joined for large-group instruction, and the amount of individualization of instruction that occurred. Although the correlation between the schools' architectural openness and educational openness was nonsignificant, there was a significant relationship between the modified openness scores of the buildings and the educational program. In other words, teachers tended to modify their physical milieu to be compatible with the educational program operating in the school. The factors that were important in determining whether or not a space and program would remain open and what conditions led to teacher satisfaction were also examined. (Author)

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What's Happened in Schools of Open Design? (A Report to Cooperating Staff)[1]

Paul Gump
Rhonda Ross
Department of Psychology
University of Kansas

The authors are interested in environments--especially those for children. In recent years, one of the significant changes in physical environments has been the change in public school design--specifically the shift from traditional, self-contained classrooms to open space instructional areas. We decided to study twenty-one open design elementary schools in northeast Kansas. Our intention was to learn more about how such schools were working out. We hoped to increase our own understanding of how variations in physical design might affect the behavior and experience of persons who inhabited the designed milieu. We also hoped to make a contribution to school personnel of this area by reporting back the experiences of the total group so that they might widen their perspective on the issue of openness in school construction.

Our study is descriptive, not evaluative. We do not assume that open design or open programs are best for schools. Rather we assume that if educators know what has happened in the use of open schools, they can direct this information to the evaluations and decisions they must make.

Schools involved in the study are those which we were able to locate within reasonable commuting distance from Lawrence, Kansas. The cooperating districts and their schools appear on Table 2 on page 6. The oldest school had been in service for eleven years, the newest for two (average, six years). Sufficient experience had been accumulated by these twenty-one schools so that it was reasonable to study what had happened in their use.

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[1]The time, information, and patience of many administrators and teachers made this account possible. For their cooperation and their insights, the authors sincerely thank staff members in the following school systems: Eudora, Horton, Kansas City, Lawrence, Oskaloosa, and Shawnee Mission.

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The following five questions guided our research effort:

(1) What was the degree of physical openness in the original design of each of the schools? (This question required development of quantitative measures of design openness.)

(2) What was the degree of physical openness after staff had an opportunity to modify this openness? (Modification could be accomplished by closing folding walls, building partitions, introducing screening furniture, etc.)

(3) What was the degree of openness of learning activity, of school program? (Open construction is said to support certain educational practices which might be labelled "open program.")

(4) What have teachers experienced as advantages and disadvantages of the open design? How satisfied are they?

(5) What factors seem to have facilitated or inhibited maintenance of an open program in an open design?

Hopefully, a systematic review of experiences with open design, such as that implied by these five questions, would put school personnel in a better position to deal with particular open schools and to decide on future school construction.

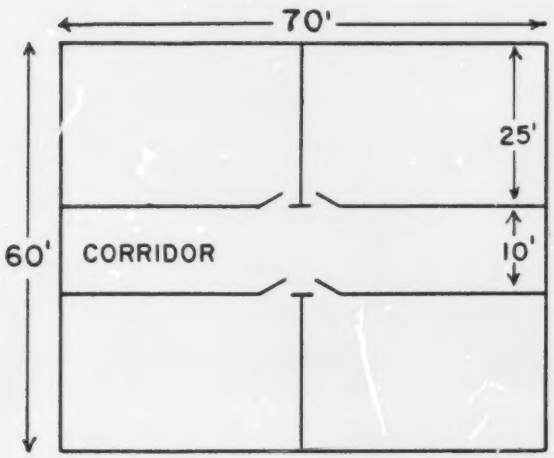
(1) The Openness of Original Design

Among the twenty-one schools, one can perceive extensive differences in the openness as it appears in the basic construction. A few older schools are built in the traditional "egg carton" style with openness achieved by provision of folding walls between two sides of each classroom. If the folding walls are closed, such schools may become almost indistinguishable from traditional ones. At the other end of the openness dimension are schools with open spaces both between and behind teaching areas. (Examples of two of these extremes appear as Figures 2 and 3 on pages 5 and 7.)

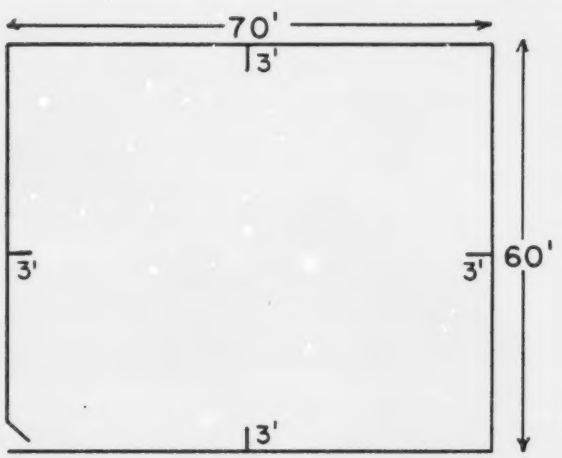
When we set about to turn design differences into measurement, it seemed most sensible to measure the "degree of enclosure" of each teaching area. But use of an enclosure measure sometimes yielded serious difficulties and the principle used to develop a measure of openness was a ratio between the length

of walls and the square feet of space. This principle, stated mathematically, is: $\frac{\text{total square feet}}{\text{total wall length}}$. Wall length for interior walls was doubled when it was plain that the interior wall separated two teaching areas. Use of this ratio principle for two hypothetical and simplified school plans appears in Figure 1 following.

Traditional School



Open School



Total Teaching Space = 70' x 50'

Total Wall Length for Teaching Space = (70 x 4) + (25 x 8)*

$= \frac{3500}{280 + 200}$

$= \frac{3500}{480}$

$= 7.3$

Total Teaching Space = 70' x 60'

Total Wall Length for Teaching Space = (70 x 2) + (60 x 2) + (3 x 2* x 4)

$= \frac{4200}{140 + 120 + 24}$

$= \frac{4200}{284}$

$= 14.8$

Figure 1. Schematic representation of determination of relation between wall lengths and square footage for schools representing traditional and open design.

*Interior walls which separate two teaching areas are doubled in length.

The reader will note from Figure 1 that the conventional school received a score of 7.3 and the open school one of 14.8. Since we desired an openness score that indicated amount of openness beyond that in a traditional school, we added one more feature to the measurement process: we determined that minimum square feet/wall length ratio of an average traditional school was 7.3. We subtracted this score from the number obtained by the ratio method indicated in Figure 1. The final design openness quotient then became: $\frac{\text{square feet of space}}{\text{linear wall feet}}$ minus 7.3.

The hypothetical traditional school in Figure 1 received an openness score of 7.3 minus 7.3 or 0; the open school obtained a score of 14.8 minus 7.3 or 7.5.

The reader might comprehend the rough value of the openness quotients by thinking of a school with classroom spaces. If these spaces had walls only at the back and one side, the enclosure would be 50%; if the back and two sides of a space had walls, the enclosure might be 75%. Enclosure per cents for a number of schools were determined and the approximate equivalences between these enclosure per cents and the design openness quotients are given in Table 1 below.

Verbal Expression of Degree of Openness	Design Openness Quotient	Estimated Per Cents of Teaching Space ("Classroom") Perimeters Enclosed
Traditional, Non-Open, "Egg Carton" Design	0-2	100-80
Conservative Minimally Open	2-4	80-67
Moderate Openness	4-6	66-56
Substantial Openness	6-9	55-45
Radical Openness	9-12	44-38

Table 1. Relationship between Design Openness Quotients and Average Per Cents of Teaching Area Enclosed.

The obtained design openness quotients for the schools are presented in Table 2. Also noted in Table 2 are the ages of the schools, and those schools whose openness was entirely or partially based on use of folding walls. Finally, Table 2 also indicates those schools with openness throughout and those for which only one wing or an addition had been constructed in an open fashion. (In these partially open schools, only the open sections are included in this research.)

Inspection of Table 2 shows design openness quotients in descending order from a high of 11.0 (School J--Shawnee Mission) to a low of 2.3 (School R--Shawnee Mission).

Illustrating the appearance of a school with a very high openness quotient, is Figure 2 below, which is a simplified outline of the academic areas of a building with an openness quotient of 10.

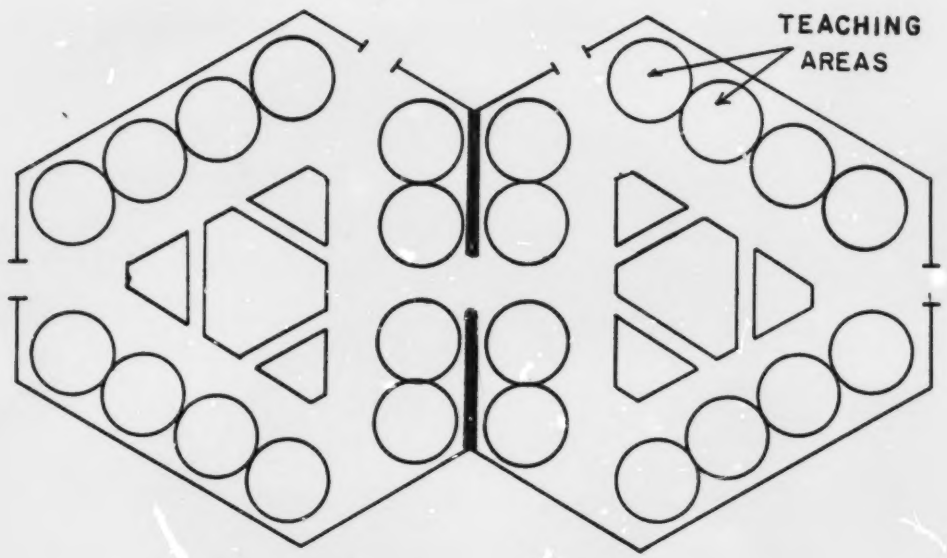


Figure 2. Schematic Representation of a School with Radical Openness.

The openness of the school in Figure 2 is such that a ring of twelve consecutive teaching spaces exists with no important partition between their sides.

School		Age Spring 1976	Design Openness Quotient	Portion of School Plant in Open Design
Kansas City, Kansas	A	5	10.1	All**
	B	4	9.8	All
	C	5	8.1	Part
	D	4	7.1	Part
	E	6	6.4	All
	F	4	4.3	Part
	G	4	2.5	Part
Lawrence, Kansas	H	8	10.3	All
	I	8	7.0	All
Shawnee Mission, Kansas	J	2	11.0	All
	K	6	8.4	All
	L	6	6.4	All
	M(f)*	7	5.2	All
	N(f)	6	4.0	All
	O(F)*	2	3.7	All
	P(F)	11	3.1	Part
	Q(F)	9	3.1	Part
	R(F)	10	2.3	All
Rural (Small Town) Kansas	S	3	8.7	Part
	T	10	8.0	Part
	U	2	4.4	All
Averages:			6.8	

Table 2. Age, Design Openness Quotient, and Portion of School Plant in Open Design for 21 Open Elementary Schools

*Note: The symbol f means that some of the boundaries between class areas can be closed by folding walls; the symbol F means that all such boundaries can be closed.

**Note: The label "All" means school plant is essentially of open construction (some special areas might still be enclosed); the label "Part" means that an open wing or open addition had been provided.

In contrast to the radically open arrangement, another school might show conventional construction except for interior folding walls. In Figure 3, such school, with a Design Openness Quotient of 3, is displayed.

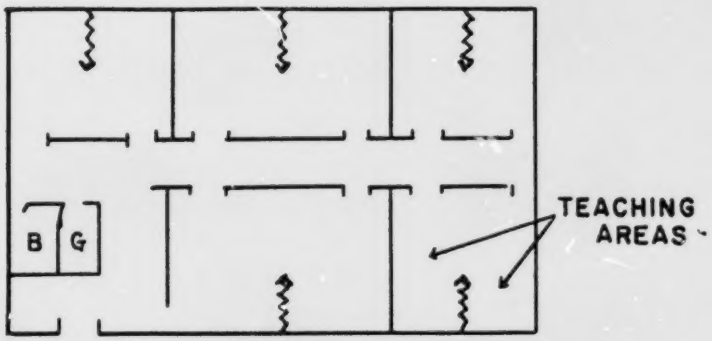


Figure 3. Schematic Presentation of School with Conservative Openness, Folding Doors (↕) Employed.

Schools with folding walls are marked "F or f" on Table 2. The reader will note that, as a group, the F schools score relatively low in openness even though their openness quotient has been determined with their folding walls open. The two most open of the folding wall schools (M and N) are so built that when all folding walls are shut, teaching areas would not be completely enclosed, i.e., some openness would remain. However, for schools O, P, Q, and R, the closing of the folding walls would result in a set of completely enclosed classrooms.

Since open construction is a recent development, it might be presumed that the more recently constructed buildings would show more openness of design. However, inspection of Table 2 fails to reveal any systematic relationship between the ages of buildings and their openness quotients. Results of the work with measurement of orginal design openness might be

summarized as follows:

> A measure of design openness was developed based on the relation of square feet of teaching space to total wall length. Range of scores ran from 2.3 to 11.0 with a mean of 6.8. In terms of the degree of enclosure of teaching spaces, five schools of minimum openness (G, O, P, Q, and R) exhibited openness similar to enclosing three of the four sides of a classroom; the five most open schools (A, B, H, J, and S) would have approximately 40% of their perimeters enclosed; the average design openness quotient would imply about 50% enclosure.

(2) Physical Modification of Openness

One major principle of ecological psychology is that physical arrangements and major behavior patterns (like school regimes or operations) must "come to terms"--that they will press toward some kind of fit. In cases of original poor fit, changes will be made in the physical habitat or in major behavior patterns or in both. If, over time, teachers and principals made considerable change in the physical arrangements, this would indicate that they found the original fit between design and teaching program unsatisfactory.

Since many of the schools' staffs had been accustomed to programs in enclosed classrooms, we assumed that changes in the physical habitat would press in the direction of increased enclosure of teaching-learning spaces. This enclosure could occur by screening (defined as use of furniture higher than four feet tall at area boundaries).

Early in the research, it became clear that certain schools had been significantly modified. As an illustration, the before-and-after occupancy conditions for one part of an open school are displayed in Figures 4a and 4b.

The reader will note that the process of enclosing or protecting teaching-learning areas in Figures 4a and 4b has taken several forms. First the library area was enclosed in the room originally marked "utility room." Areas between one learning space and another and between one space and the corridor area (middle) are marked by tall screening furniture (dividers, wardrobes, high bookcases, etc.) and by lower separating pieces of furniture (tables, low cabinets, empty desks, etc.).

To measure screening, we added the length of tall screens to that of the interior walls and obtained a new openness quotient. Literally, the new measure was "openness as modified by tall screening furniture" but the label was shortened to modified openness quotient.

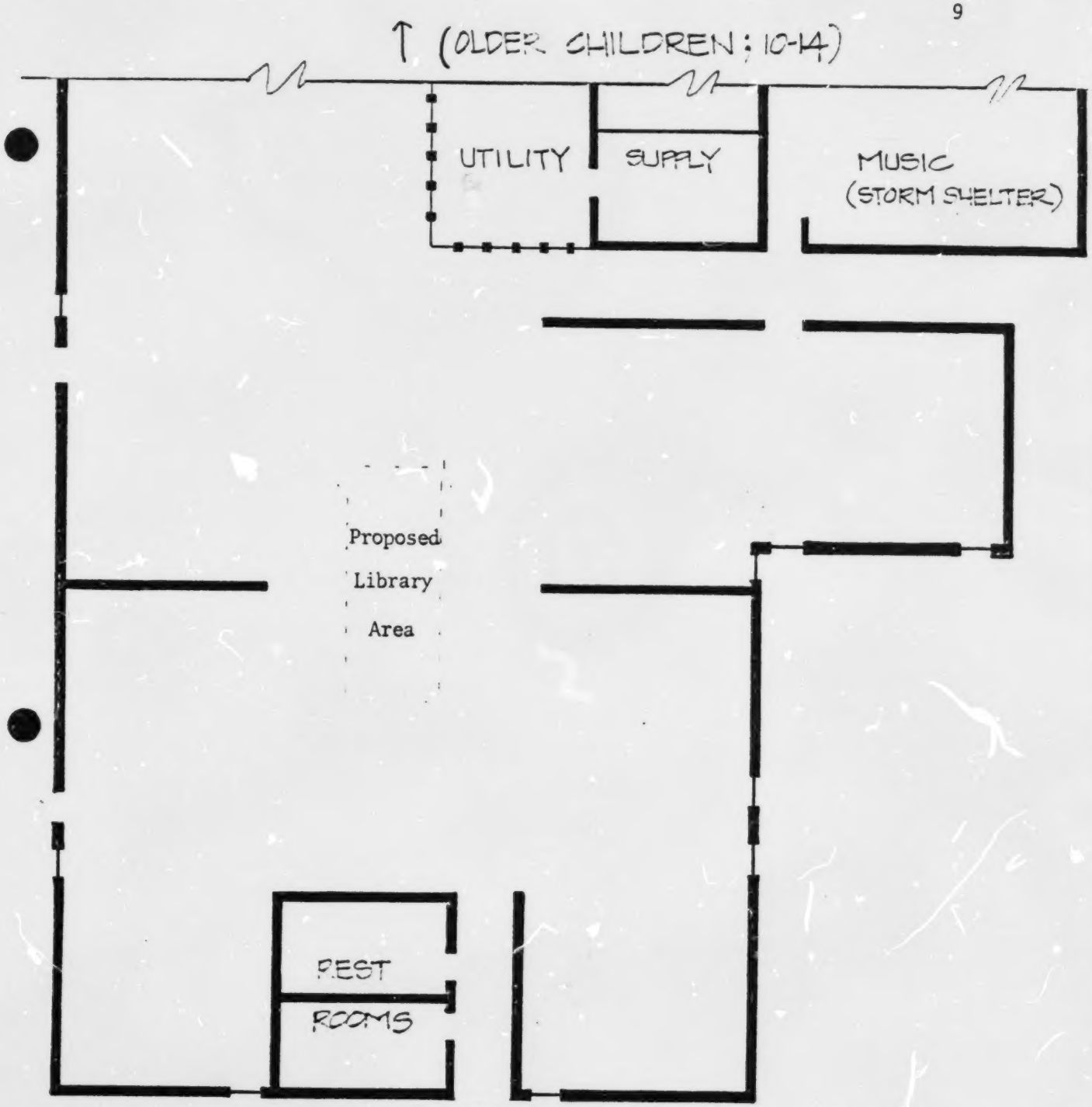


Figure 4a

Area of Open School Architecture for
Younger Children (ages 6-9)--before Occupancy

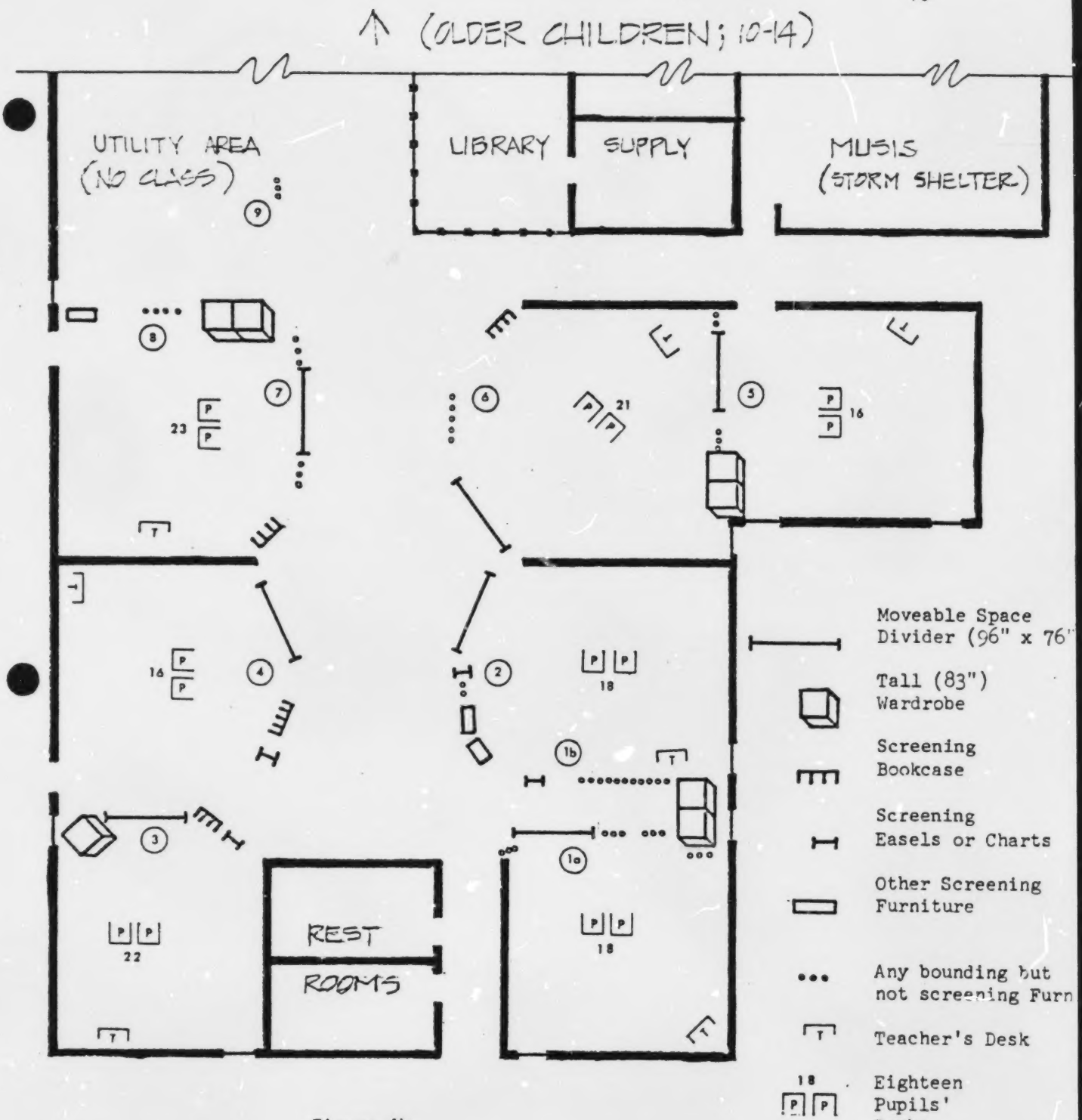


Figure 4b

Area of Open School Architecture for Younger Children (ages 6-9)-- Several Years after Occupancy

The question to be answered in the following analysis is:

> To what extent was screening (as illustrated in Figure 4b) operating throughout the 21 schools observed?

Extensive screening would be indicated by a sharp drop of scores from the original design quotient to the modified design quotient. Such screening could also be expressed as a per cent of openness that was removed by screening. Both scores appear on Table 3.

The modified openness scores range from a low of 0.0 to a high 10.3 with a mean of 4.2. In terms of enclosure, the average enclosure went from about 50% in the original openness to 65% in the modified condition. Schools reacted so differently to the openness that overall scores are probably misleading. All but two of the Kansas City schools have minimal reduction--most of these schools left tall screening furniture out of the spaces between learning areas. The two schools with some modification (B and D) used screening for special learning activities: e.g., special education or art; even these schools did not screen ordinary teaching-learning areas. In Lawrence, there was almost no screening.

Shawnee Mission presented a picture of contrasts. The most openly designed school (J), had the most addition of interior screening (openness dropped from 11.0 to 2.6). This school was designed so that demountable partitions could be easily erected to become walls; school personnel, to a large degree, took advantage of this opportunity. (With all of its partitions School J remained a modestly open school; its modified openness quotient of 2.6 was still slightly higher than the original openness quotient of School G.) Other schools in Shawnee Mission which reduced their openness severely were those with folding walls (O, P, Q, and R). In these schools there were 35 folding walls and 32 were kept closed. Schools M and N also had folding walls but the closure of all of these would still have left much open space--an arrangement not true for schools O, P, Q, and R.) Four of the Shawnee Mission schools remained fairly open: K, L, M, and N.

All three of the rural schools were heavily modified by screening. School S bought 12 portable partitions--one for every classroom. These dividers, ten feet long with five foot "extenders," could provide 15 feet of partition. Their use reduced openness from an original score of 8.7 to a modified one of

School		Design Openness Quotient	Modified Openness Quotient	Per Cent that Openness is Reduced
Kansas City, Kansas	A	10.1	9.8	03
	B	9.8	7.1	28
	C	8.1	7.8	04
	D	7.1	4.4	38
	E	6.4	5.3	17
	F	4.3	4.3	00
	G	2.5	2.5	00
Lawrence, Kansas	H	10.3	10.3	00
	I	7.0	5.7	19
Shawnee Mission, Kansas	J	11.0	2.6	76
	K	8.4	6.9	18
	L	6.4	6.3	02
	M(f)*	4.2	3.9	07
	N(f)	4.0	4.0	00
	O(F)	3.7	.6	84
	P(F)	3.7	.7	81
	Q(F)	3.1	0	100
	R(F)	2.3	0	100
Rural (Small Town) Kansas	S	8.7	2.9	67
	T	8.0	.5	94
	U	4.4	2.2	50
Averages:		6.8	4.2	38

Table 3. Original Design Openness Quotients, Modified Design Openness Quotients and Per Cent that Openness is Reduced for 21 Open Elementary Schools.

*(f = folding walls available to close up some of the boundaries between class areas; F = folding walls available to close all class areas.)

only 2.9. The most complete abandonment of open design for all 21 schools occurred in School T where openness changed from 8.0 to .5 by the erection of eight foot plywood walls at every boundary of a learning area not already walled off.

Examination of the data on use of screening leads to several summary assertions: First, one-fifth of the schools reacted to design openness by an almost complete return to traditional, non-open architecture (O, P, Q, R, and T). Further, three more schools modified their space to a point of minimal openness (J, S, and U). So it is clear that open construction for over one-third of the schools was not a satisfactory arrangement. On the other hand, for ten schools there was relatively slight modification (A, C, E, F, G, H, I, K, L, and N).

Second, it would appear that, if easy ways are at hand to change open spaces into enclosed classrooms, these ways tend to be used. Such ways were available in schools J, O, P, Q, and R--and their openness was markedly reduced.

Reduction of openness implies that the original physical milieu was judged unsatisfactory for the operating behavioral program. But, if school personnel do not reduce openness, does this imply satisfactory fit of design and program? Consider the case of the Kansas City schools where there was no extensive screening modification. Does this mean that the Kansas City teachers were satisfied with the fit of the open design to the programs they established? We have data on teacher satisfaction to be presented later. For now, it should be mentioned that several different staff in the Kansas City system declared that the use of tall screens was against the policy of the central administration. Thus, absence of modification may not demonstrate satisfaction with design--other factors may have counteracted modification.

(3) Degree of Openness of School Programs

An educational purpose or rationale is associated with constructing open schools; presumably, open physical environments are to foster open behavior programs. But what is an open program? Educators have proposed a variety of definitions for open schools which we will not review here. The conceptualization of open program for this investigation emphasizes those educational practices which seem most reasonably related to open space. Once this

conceptualization was converted into measurements, we tested to determine whether open space--as represented in the 21 schools--was indeed associated with open program. Since physical milieu and teaching program are presumed to "come to terms," we might expect that more physically open schools would exhibit more open programs. If schools with less open programs were prevented from modifying open structure, we could expect relatively high teacher dissatisfaction.

The questions submitted to data were:

To what extent did the 21 open schools actually operate with open educational programs?

Were variations in design openness associated with variation in program openness?

Did the milieu and program "come to terms" as predicted?

Was there especially sharp dissatisfaction where this "coming to terms" was prevented?

Definition and measurement of open program. Our idea of program openness is based on the assumption that open physical space provides visual and commuting access to persons, places and things. Openness makes possible the bringing together of large groups; openness may invite cooperation among teachers who share a large space. Finally, openness can facilitate individualization of instruction since wider selection of materials, places, and personnel are possible in an open physical environment. These ideas are specified and illustrated below; they represent our criteria for openness and formed the more specific basis of measurement of program.

Programs were judged open depending upon the extent to which:

1. Teachers dealt with a variety of students rather than with a single "home-based group of own students." (Example: Four teachers in a large space pooled their resources and their pupils to establish eight reading levels with eight different sub-settings. Pupils were sent to the appropriate sub-settings and teachers.)

2. Groups from different areas were joined for large group learning activities. (Every Wednesday afternoon pupils from four bases combined for a movie and discussion of some aspect of social studies.)
3. Teachers taught as a team, worked together educating a group. (One teacher demonstrated a new math process with an overhead projector while pupils worked similar problems at their seats; another teacher scanned the group and helped those who were not catching on.)
4. Operating programs provided for individual differences in level of achievement and/or in interest. (Students chose mathematics problems and materials that were finely graded to fit their current tested achievement level. Or, students selected the learning center and the project at that center that most appealed to them.)

To discover the degree to which the above practices operated in each school we asked at least one teacher from each grade level to describe, in sequence, her teaching activities for the preceding day. By use of questions, it was possible for this description to present systematically the subject matter or "concern" of each activity, its location and materials, its pupil personnel (whether the teacher's own or drawn from surrounding areas), whether teachers cooperated in the activity, and whether individualization, based upon current achievement or individual interest, was clearly established.

From the teacher interviews, it was also possible to determine the teacher's base time. That is, a teacher's day may extend for seven hours but only five hours may be spent in direct management of students' curricular activity. These five hours would be the base time. (Non-base time was preparation time, managing recess or lunch periods, rest periods, etc.) The base time was used to determine the proportion of teacher time devoted to specific kinds of activity. For example, if a teacher showed a base time of five hours and during one of these hours she worked with children outside her own group, the teacher's score for "with non-own pupils" was one hour divided by five hours, or 20%. Other scores could be obtained for "joined groups,"

"team teaching," and "individualized instruction."

The four scores for different aspects of open program could be combined into a composite score. Since the average on three of the scores was roughly similar, these scores were simply added together. The "with non-own pupils" score averaged three times as high as the others. In order that this score contribute equal weight to the composite, it was divided by three and added to the other three scores. The resulting composite score made it possible to deal with one score for each school and simplified the analysis.

Open program scores for all schools. Basic findings for openness of program appear on Table 4. Each aspect of openness is recorded and a composite openness score is added. The rank of the schools in terms of composite score is also represented. Ranks have been assigned so that the highest composite score would receive the first rank, the lowest score, the 21st.

The scores on Table 4 make it clear that, although these schools were all of open construction, the proportion of time that teachers spent in running aspects of open program is rather small. For approximately 90% of the time, the teacher was not dealing with joined groups, was not involved in team teaching, did not manage a program of individualized instruction. During only one third of the time was a teacher dealing with children beyond a base group of her own.

It might be argued that the low openness scores obtained here might still be higher than would have been obtained from a control group of traditionally designed schools. Our resources did not permit such a control group. But we have data almost as useful: extensive variations in amount of design openness in the 21 schools. If openness of original design encourages open programs, there should be a correlation between design openness and program openness. (A correlation of open design with open program would not prove that design influenced program--but an absence of correlation would prove that there was no such influence.)

When all schools were ranked on openness of design and on openness of program, the correlation (Spearman r) was non-significant (.10). Within these schools, then, original open design and open program are simply not associated.

Is there any relationship between physical provisions and program? Do milieu and program "come to terms"? The reader will note that some of the

		Non-Own Group	Joined Groups	Team Teaching	Indiv. Instr.	Composite Openness Score	Openness (Composite) Rank
Kansas City	A	08	08	06	09	29	13
	B	21	02	02	04	15	16
	C	33	17	16	10	54	08
	D	19	00	00	10	17	14
	E	41	35	07	20	76	04
	F	20	00	00	C9	16	15
	G	07	00	04	02	08	21
Lawrence	H	60	10	02	23	55	06
	I	76	17	17	00	60	05
Shawnee Mission	J	46	12	12	13	52	09
	K	69	21	14	21	79	03
	L	88	30	23	27	109	01
	M	40	13	15	13	54	07
	N	58	38	16	21	94	02
	O	32	04	04	19	37	12
	P	47	11	11	11	49	10
	Q	08	02	02	07	14	18
	R	41	10	18	00	41	11
Rural Schools	S	21	02	00	00	09	20
	T	08	06	00	06	15	17
	U	19	04	01	01	12	19
Average		33	11	08	11	43	

Table 4

Per Cents of Base Time that Teachers Spend in Four Aspects of Openness; also Composite Openness Scores with Openness Scores with Openness Rank. (Low Rank = High Open)

schools which rank very low on openness were the same schools that extensively modified their original physical openness. For example, the rural schools (S, T, and U) sharply reduced their openness and their program ranks are 20th, 17th, and 19th. On the other hand, the Lawrence schools did not modify their openness and they rank 5th and 6th in openness (Table 3, p. 12). When the modified openness scores are correlated to the program scores, the resulting correlation is .46, a statistically significant relationship. In other words, original openness and program are not related, but modified physical openness and program are.

It will be recalled that central administration of the Kansas City schools pressed schools to leave their spaces open whereas indications were that schools in the other systems were permitted to adapt these spaces with screening. When the Kansas City schools are withheld from the analysis and the relationship between modified openness and composite program openness is calculated, the result is a correlation of .70 ($p < .01$). In other words, where the schools are given autonomy with regard to modification, the "coming to terms" of physical milieu and educational program is quite substantial. (Again, it must be emphasized that this fit of milieu and program refers to the modified milieu--the correlation of original design and program for these non-Kansas City schools was a statistically non-significant .22).

Maintaining physical arrangements which do not fit behavioral and program operations might lead to difficulties and blocked expectations. If this is true, then teachers who practice traditional methods in open spaces might be especially dissatisfied. We obtained several measures of teachers' reactions to open space school and so this prediction can be tested by the data to be presented below.

Before leaving the issue of open programming, it should be noted that there were schools of open design which did not significantly modify those designs and which maintained open programs. Later, we will wish to examine information from such schools in terms of "what it took" to sustain openness of program. For now we point out that four schools received relatively high openness scores: Kansas City E, Shawnee Mission K, L, and M. Schools of less openness but still which might have been included are: Kansas City C, Lawrence H and I, Shawnee Mission J and M. However, we interpret all scores together as indicating that in most schools most of the time, open programs were not operating.

(4) Teacher Reactions to Open Design

Teachers were given an opportunity to communicate their reactions to teaching in the open schools. A total of 210 teachers gave their degree of satisfaction with the schools, their ideas of advantages and disadvantages with open construction, and responded to other issues. Since there were some schools who had so modified their spaces that they could no longer be called open (O, P, Q, R, and T) data for certain questions from these schools were withdrawn from analysis. School T had so completely converted to traditional design that the Questionnaire was not administered.

Teacher satisfaction with open design. Among the questions that dealt with reactions to the open design were two that seemed revealing: "Other things being equal, would you prefer to teach in an open building or one of traditional design"? and "How would you rate your satisfaction with the open design of this building"? For this second question, teachers selected one of the following:

Very Dissatisfied	Somewhat Dissatisfied	Rather Neutral	Somewhat Satisfied	Satisfied	Very Satisfied

The above dimension could be changed into a score with "very dissatisfied" equivalent to "6," "somewhat dissatisfied" equal to "5," and so on until "very satisfied" was equal to "1." The results of tabulation of the two items appear on Table 5.

Inspection of Table 5 will show that, overall, teachers were not especially pleased with the open construction. Only about half would select an open design for their teaching although they are now teaching in schools labelled open. As expected, schools which so heavily modified their design as to make themselves into traditional schools did not select open schools. (These schools were: O, P, Q, and R.)

Most Kansas City teachers did not prefer open construction; however, two schools (E and F) were very much in favor of openness. In terms of the satisfaction question, teachers in Kansas City were either modestly satisfied (C and D) or somewhat rejective (A, B, and G); again, schools E and F were the exceptions and expressed satisfaction.

Lawrence teachers were clear cut in their acceptance of the open construction which was preferred by 92%; satisfaction scores were almost always "satisfied" or "very satisfied."

		Average Per Cent Preferring Open	Average Degree of Satisfaction
Kansas City	A	22	4.3
	B	21	5.0
	C	50	3.0
	D	40	3.6
	E	86	1.8
	F	100	1.8
	G	14	5.7
Lawrence	H	92	1.7
	I	92	1.3
Shawnee Mission	J	94	2.5
	K	75	2.0
	L	76	2.2
	M	75	2.0
	N	86	1.4
	O	00	2.2
	P	35	3.1
	Q	07	2.4
	R	00	2.4
Rural Schools	S	58	2.7
	T	-- (Questionnaire not	-- Given)
	U	58	4.5
Average		52	2.8

Table 5

Teacher's Response to Physical Openness of Schools: Per Cent Preferring Open Construction and Degree of Satisfaction*

*Degree of Satisfaction:
1. Very Satisfied
2. Satisfied
3. Somewhat Satisfied
4. Rather Neutral
5. Somewhat Dissatisfied
6. Very Dissatisfied

Certain Shawnee Mission schools remained reasonably open in physical design: J, K, L, M, and N; these all preferred open construction and gave positive satisfaction scores for the design of their buildings. Other schools also gave positive scores to their buildings--O, P, Q, and R--but this means that they approved of the building which, though designed for possible openness, could be (and was) closed off; the votes of these schools could not be said to favor open design.

The rural schools were generally rejective of open construction. Although a slight majority in School S say they prefer open design, in School U, 80% are against it. As already noted, the third rural school (T) simply walled off its openness and so it must be counted as against openness although no questionnaires were administered.

Another way to view the data on Table 5 would be to consider whether there is a relationship between the kind of program and the satisfaction of teachers who manage it. The question might be put: "If schools remain at least partially open (all schools except O, P, Q, R, and T), is there a relation between teacher satisfaction and the degree of program openness"? For this analysis, refer to Table 6.

The relation between program openness and teacher satisfaction is quite clear from Table 6. If we consider just those schools which retain, after modification, a significant degree of openness, we find that teachers from schools attempting some openness of <u>program</u> tend to be satisfied with the building, those who are not attempting openness in program are not satisfied. The actual correlation is .69 ($p < .01$).

Our earlier hypothesis asserted that when milieu and program did not "come to terms," the program managers (here, the teachers) would be especially dissatisfied. Such schools would be those where a traditional program operated in an open unmodified milieu. Such schools exist in Kansas City where adaptation of the milieu was discouraged. These schools were: A, B, D, F, and G. All except School F have relatively low satisfaction scores; the average score for these five schools is 4.1. In contrast, the scores for all other schools (which either operated relatively open programs or which heavily modified their architecture and ran traditional programs) was 2.2. (The difference is statistically significant: $p < .05$).

		Program Openness Score	Program Openness Rank	Teacher Satisfaction Rank	Teacher Satisfaction Score
Kansas City	A	29	10	13	4.3
	B	15	13	15	5.0
	C	54	08	11	3.0
	D	17	11	12	3.6
	E	76	03	4.5	1.8
	F	16	12	4.5	1.8
	G	03	16	16	5.7
Lawrence	H	55	07	03	1.7
	I	60	05	01	1.3
Shawnee Mission	J	52	09	09	2.5
	K	79	02	6.5	2.0
	L	109	01	08	2.2
	M	57	06	6.5	2.0
	N	94	04	02	1.4
Rural Schools	S	09	15	10	2.7
	U	12	14	14	4.5

Table 6

Relation between Program Openness and Teacher Satisfaction for Schools which Retain Some Physical Openness after Modification.

In summary, what may be said regarding the degree of teacher satisfaction in these schools? First, overall satisfaction is barely positive; if fact, only about half prefer open construction. Secondly, teacher satisfaction with design depends upon the extent the physical design and the teaching programs have "come to terms." If relatively open programs are run in open designs, then satisfaction is good; if non-open programs are run in buildings that have been modified partially back to traditional design, satisfaction is reasonably good. Most dissatisfaction occurs when the design remains open and the program is non-open (i.e., traditional).

"What do you see as advantages--if any--in open architecture for schools"? The 465 answers given by 210 teachers were coded and the following advantages were most frequently suggested:

> Openness provides flexibility of space useage, makes for ease of movement, for convenient grouping and regrouping. 60% of the teachers mentioned this.
>
> Teachers can act together; team teach, relieve one another, back each other up. 41% of the teachers.
>
> People (mostly teachers) can enjoy the psychological benefits of togetherness: mutual stimulation, feeling of affiliation, etc. 32% of the teachers.
>
> Broader experience (for teacher or pupil) comes from the wider association possible in open schools. 21% of the teachers.
>
> The individual needs of children can find a better fit in the open space arrangement. 18% of the teachers.

The remainder of the advantages were either too general or too infrequently mentioned to be reported.

The number and kind of advantages (and disadvantages) might be expected to vary with the extent to which teachers reported from schools which operated with some program openness. To examine this expectation, the seven most open schools (E, H, I, K, L, M, and N) were compared to the seven least open (A, B, D, F, G, S, and U). As might be expected, teachers from the most open schools reported the most advantages (median of 2.5 versus 1.6, $p < .04$).

Teachers from the more open programs reported more advantages of all the types listed above; they were, however, particularly likely to note that the open building assisted an open program which better met the needs of the children. Clearly, the evaluation of open architecture was not only more positive but different in pattern for teachers who were experiencing some program openness.

Finally, although most teachers listed both advantages and disadvantages, there were three schools (B, D, and G) in which almost half of the teachers would offer no advantage for open design.

"What do you see as disadvantages--if any--in the open design for schools"? A total of 381 answers were offered by the 210 teachers. Most of the disadvantages given could be coded under one or the other of the following five categories:

1. Distractions--mostly for pupils but sometimes for teachers--are created. 42% of the teachers mentioned this.
2. Noise as a problem--without mentioning distraction--from noise. 37% of the teachers.
3. Loss of certain activities because they would be disturbing in an open milieu. 23% of the teachers.
4. The "cost" of the open program in terms of the hard work, the dedication, required of teachers if the program is to succeed. 25% of the teachers.
5. Much planning and high structuring of activity is required to make it work. 12% of the teachers.

The seven most open program schools reported 1.6 disadvantages per teacher, the seven with the least open program cited 2.1 disadvantages per teacher, ($p < .03$). These results are a complement to those obtained for advantages and show that how a teacher responds to open design depends upon whether open programs are operating. Further, the particulars of disadvantages vary according to the presence or absence of some program openness. Teachers who are running traditional programs are much more likely to see noise and distraction as the overiding problems (items 1 and 2 above); teachers administering open programs agree that distraction is a problem but are much less distressed by noise; instead they acknowledge the cost of the open program in terms of the hard work and the very con-

siderable planning required (items 4 and 5 above).

The quantifications described above hardly do justice to the meanings and feelings expressed by cooperating teachers; we could emphasize two aspects of their material. First, considerable insight was displayed about the possibilities and problems involved in open programs. Teachers who were having successful experience with the open program were enthusiastic about some of the values mentioned above but were also honest about the cost of openness in terms of effort and dedication. On the other side, teachers who were enduring the noise and distraction in the unmodified open design--without the satisfaction of open operation--were sometimes intense in their reactions. One such teacher declared, "If the board would let me do, I'd pay out my own money to put up walls!" Another teacher, hearing that a colleague was going to a self-contained classroom next year, said enviously, "Slam a door for me!"

5. What Factors have Facilitated or Inhibited Maintenance of an Open Program in an Open Design?

From conversations with principals and teachers at each school, it became clear that the maintenance of open program was a serious matter. Openness appears vulnerable. When principals were changed, when new teachers came into the system, when school population increased, when dissatisfaction with noise and disorder increased, the school program would most probably retreat from the open arrangement. As one teacher reported, "Every year more gets eliminated."

Our minimum description of open program, as used in this research, has been stated above (pp. 14-15). The open program will involve considerable individualized learning in terms of level of work and choice of learning experiences; on a number of occasions teachers will pool their ideas and their work in order to establish the variety and choice supporting the individualization. Students will be relatively mobile in that they will travel to different places and work with different staff during the school day. Clearly, the maintenance of such a system requires that staff continually work together in a concrete, face-to-face manner. A modicum of cooperative spirit is required in any elementary school; however, the

coordination of effort required in the open program far exceeds a polite "getting along together."

At one level of analysis just three things are required to create and maintain any school program: desire, capacity, and enabling conditions. The persons involved have to really want the program, they have to possess the necessary ideas and skills, and the conditions for implementation have to be favorable.

Desire. Staff for some schools were not particularly interested in an open program. When one rural school changed from a traditional to an open building, no serious effort went into revised educational practices--administrators, teachers, and children simply moved from one site to another. In another rural school, two staff members were enthusiastic about trying an open program but when they left the system during the first year in the open building, the push for an open program ceased.

Desire for an open program in a particular school comes about through several kinds of events. One approach involves selection. Perhaps administrators find a principal who truly wants an open program; the principal selects teachers who also want an open learning environment; later, teachers and principal together may interview prospective teachers and help select those who are attracted to open arrangements.

If an open operation has even a few teachers who oppose an open program, the effect ripples beyond these few; if one member of a working group of three or four decides not to cooperate, the group usually retreats from the open system.

Many teachers remarked about the necessity for teachers to "be compatible"; trying to judge compatibility on the basis of "personality" is not feasible; however, one may judge that a necessary minumum of compatibility is missing if some teachers desire open operations and others do not.

The extent to which the open program was desired seemed also affected by how much staff had a vision, a conception of what openness could be. Experiences in teacher training, workshops and conferences, visits to open operations and conversations with successful practitioners were some of the events increasing teachers' desire to manage an open operation.

Teacher desire was closely related to the stand taken by the school principal; teachers were very sensitive to whether the principal wished an open operation and was willing to work hard for it--or whether he was lukewarm towards openness and more concerned with other priorities (e.g., "good discipline"). If the principal was not "sold" on openness, most teachers did not struggle to create or preserve it.

Finally, desire is increased by the rewards that follow the operation; according to questionnaires, some of these rewards involve the sharing, the collegial, relationship with other teachers. If there were interferences to the rewards in these close and continuous interactions, the desire to maintain an open system was reduced.

Capacity. The desire to participate in an open operation is doubtless much affected by whether the principal or teacher believes that he or she has the requisite personal resources. An obvious necessary resource is energy. Teachers who have operated in both arrangements agree that the open system requires more concentration and labor. For example, the preparation of learning centers takes time; the provision of feedback to students takes more effort when they carry out many different tasks; the meetings with other teachers will also absorb much teacher time and energy.

Those teachers who felt most comfortable with openness had often experienced the method in another school or in teacher training. Exactly what skills are involved, this study cannot say. However, certain psychological capacities seemed important in the open systems observed. An open arrangement means that a variety of events will be occurring simultaneously; the teacher is supposed to monitor and to react to these many things. If a teacher had difficulty "doing several things at once," the open system taxes that teacher heavily. The technical label for this capacity is "handling overlapping situations"; we presume teachers, and people generally, differ in this skill.

Conditions for open operations. To provide richness and individualization, a variety of teaching materials must become available to teachers in open education. Availability means both presence of the materials and some ease in their selection and procurement. In the more successful open programs, the teachers in the resource area were quite helpful in

making classroom teachers aware of the reference and audio visual aids available for particular curricular units and in delivery of these materials.

The behavior of the resource area person established conditions which reduced the effort teachers had to invest. Another work reducer was use of parent volunteers in some of the successful open schools. Use of parents also may mean that word gets back to other parents that the open program is not just a matter of letting kids do as they please but a responsible operation; such communication may help school-community relationships.

Another requirement for open teaching is space--not only space in which to locate children and teachers but in-between ("buffer space") as well. Crowded conditions in some schools meant that formation of small groups would position children so close together as to cause distraction. In general, it seemed that crowding in a school of open design--regardless of program--created more widespread complaint than crowding in a school with classroom walls.

Noise and distraction are often derivative conditions that discourage open operations. The noise is less of a problem when activities are scheduled so that the noisey activities of various groups occur simultaneously and group activities requiring a more serene atmosphere are scheduled at other times.

The scheduling issue is even more important in two other related matters. If teachers interlock their teaching moves and deal with a shared group of students, these students must all have blocks of time at the same location. For example, if the third grade teachers wish to cooperate in presenting a coordinated program in reading and social studies, they must have blocks of time when all teachers and students are present in the same place. There were a number of school situations in which sufficiently frequent and extended blocks of such shared time were not available. The operation of Title I remedial programs created much fragmentation of possible "together time." In fact, the investigators were sobered by the numerous reports of school days in which student groups would frequently be split after only brief periods of operation and later be interrupted again by return of students from other activities.

One might wonder if "chopping up" the school day doesn't block momentum in learning, if it doesn't lead to a kind of trivialization of learning activity.

Also related to scheduling is the question of teaching planning time. Coordination of teacher's efforts requires sharing decisions about what will be taught, with what resource and site arrangements, and who will take which responsibility in the operation. Further, if the program is to improve, time is required for sharing experiences and data on how well particular arrangements have worked out. If mutual planning time cannot be established, teacher groups cannot sustain open programs.

Teacher planning time typically rests upon special teachers (music, art, library, or P.E.) taking students for a period and relieving the regular teachers. Repeatedly, it was found that the schedules of the special teachers were such that planning times for teachers of a particular grade were not simultaneous; thus, little or no mutual planning time was established.

In the above discussion, factors of desire, capacity, and conditions have been discussed separately; actually there is much interdependence. For example, strong desire may result in establishing proper conditions. One principal, committed to an open arrangement, managed to obtain teachers who could teach some regular subjects and also cover some of the "specials." Thus, the schedule of the special teachers came under staff control and necessary planning times could be arranged. This example is a part of a more general necessity for open programming and that is the freedom to employ personnel in a flexible manner. Rigidity about "who must do (and not do) what when"--whether based on administrative decree or on contracts between teachers and the school system--does not mix well with an open arrangement.

The interdependence between desire, capacity and conditions is such that one kind of event can affect all three factors. A principal may establish and attend teacher planning meetings (during regular school hours) so that he and a small group of teachers can devise curricular units. This event will likely maintain or increase <u>desire</u> to have the open program since the teachers can experience the support and the commitment of the principal as well as enjoy the collegial rewards of mutal planning; teachers will

probably increase their capacity to handle the open program as they share problems and possible solutions; finally, the regular meeting provides a chance to improve conditions (scheduling, resources, etc.) which enable the open program.

A final observation about the factors that inhibit openness relates to power of staff to control events within their school. An open program probably requires experimentation in scheduling, in resource and personnel allocation; if events outside the school prevent or disrupt this experimentation, openness becomes much more difficult to achieve. This is not to say that autonomy for the local school necessarily results in an open program; several of the rural open schools were reasonably free to set their own course but did not strongly desire to set it in an open direction. Still, it seemed that local control was an important, if not sufficient, condition for maintenance of an open program.

In summation, the creation and preservation of an open program is not an easy matter. It requires that participants really desire such an approach, that efforts in selection and training result in the personal capacities required, and that administration, principals, and teachers persist in establishing the requisite enabling conditions. Educators may decide not to try for an open operation; if they decide for it, serious and prolonged dedication is required.

Summary

Employing blueprint inspection, systematic observation, structured interviews and questionnaires, we studied twenty-one schools of open construction in several cities and rural towns of northeast Kansas. The general question was how these schools had adjusted to their open design. Specific questions included: How open in design were the schools originally? Could this physical openness be given quantitative measurement? To what extent did the schools remain physically open after several years of use? How open were the programs operating in the schools? Was there any relationship between school design and school program? What did teachers find as advantages and disadvantages in using the open schools? What factors influenced whether schools of open physical design actually operated open educational programs?

Original (blueprint) design openness. (Pages 2-8 in the report). A method of quantifying degree of physical openness was applied to the blueprints of the schools. The measurement could be expressed in terms of the extent to which a traditional classroom space would be enclosed on all four sides. Considerable variation in physical openness was revealed. Five schools exhibited minimum openness roughly equivalent to enclosing three sides of a traditional classroom space, most of these schools provided folding walls, which could be closed so that the traditional four wall classroom space would be established. The five most open schools received openness scores approximating that of enclosing about 41% of the classroom space. Average enclosure was around 52%.

Modified design openness. (Pages 8-13 in the report). Use of the buildings led some staff to modify the openness by introduction of various screens and barriers: Use of dividers (and furniture to function as dividers), closing of folding walls, and even introduction of interior walls. The average reduction of openness was similar to changing enclosures of classroom space from half to almost two-thirds. This average obscures some dramatic differences between schools. Eight schools did not significantly reduce blueprint openness. On the other hand, five schools introduced enough barriers between spaces to recreate the traditional four-wall classroom enclosure; the four of these five schools had sufficient folding walls to establish the traditional enclosure and they did so. Several schools made substantial reductions in openness but the original openness had been so extensive that much physical openness remained. We judge that at least eight schools made sufficient reduction of openness to indicate major dissatisfaction with the original degree of openness. Further, several other schools would have reduced openness but were discouraged by district policy; see the section below: "Teacher-reported advantages and disadvantages."

Program openness. (Pages 13-18) Openness was defined along four dimensions: The extent to which teachers dealt with a variety of students (instead of just her own base groups), the degree to which groups from various areas were joined, the amount of team teaching, and the scope given to children to handle learning activities matched to their individual

competencies and interests. A composite openness score was assigned to each school. (The reader may wish to examine the actual measurement operations to determine how much our conceptions of an open program match his own. Our judgement is that the criteria used are close to the openness implicit in the open design and also give some scope to the individualization of learning which has been a central part of the openness philosophy.)

Schools differed markedly in program openness; we would judge that most of the time in most of the schools programs no more open than those of traditional self-contained classroom operated. On the other hand, four schools operated programs with substantial openness.

A general hypothesis about environment and behavior is that these two arenas "come to terms." In regard to schools, this should result in open physical design being associated with open program. To test this hypothesis, all schools were ranked according to their original (blueprint) openness and then according to their program openness; the resulting relationship was quite weak--a correlation of .10. Clearly the degree of original building openness could not be used to predict the openness of the program that operated in that building. However, the ranks of schools on modified openness and program openness were significantly correlated--.46. (When those schools which were prevented from introducing screening were withheld from the comparison, the relation between modified openness and program openness was even more substantial--a correlation of .70) Thus, the physical design of schools, as modified physically, and their program did "come to terms."

Teacher-reported advantages and disadvantages. (Pages 19-25) Questionnaires from 210 teachers in these open schools showed that about half preferred open construction and half preferred traditional. The overall statement obscures important differences and relationships within the questionnaire data. Teachers who were involved in schools where open programs operated were generally happy with their buildings; those who taught relatively traditional programs in modified openness were minimally satisfied; teachers from a district which discouraged physical modification and who taught traditionally were usually unhappy with open construction.

The advantages of open buildings were more frequently cited by teachers of open, rather than traditional, programs; these advantages were ease of movement and grouping, opportunities for teachers to act together and to enjoy mutual stimulation and feelings of peer affiliation. Teachers of open programs were likely to note the advantage of better fitting learning activities to the individual needs of children when using an open building.

Disadvantages of the open building were seen as noise and distraction--particularly by those trying to implement traditional programs. Teachers of open programs were aware of these difficulties but they also mentioned the cost of energy, time, and dedication required to maintain an open program.

Factors involved in facilitating or inhibiting an open program. (Pages 25-30). Interviews with principals and experienced teachers indicate that the existence of an open program might relate to factors in three areas: Desires, capacities, and conditions.

Staff in some of the open designed schools had never wanted an open program and the open building was simply a new place to do old things. In other schools, the portion of the staff desiring an open program had insufficient influence. The most successful open schools managed to select staff who wished to create and maintain program openness. Desire for openness was also based on the visions, the conceptions, staff possessed of what was possible; these conceptions had been developed from experiences in teacher training, from work in other open schools, from workshops and visits to successful open operations. Desires of teachers for openness were highly related to the desires of the principal. If principals showed by their efforts that they supported openness, teachers tended to support it also. Finally, the questionnaires would indicate that when the cooperative effort required for openness increased the stimulation and the sense of affiliation of teachers and principals experienced with one another, these rewards sustained a desire for open operations.

Capacity of staff seemed related to energy and time demands. Work with an open program is taxing and not everyone could sustain the required personal investment. A particular quality of openness is a variety

of simultaneous events and concerns, some individuals could cope better than others with these "overlapping situations."

Conditions for open operations include sufficient supplies, space, and assisting personnel. Scheduling turned out to be a major issue. The interlocking of teacher and pupil efforts in the open arrangements required that these people share extended blocks of time in the same general location; often this common time was insufficient. Closely related was the matter of common teacher planning time; these times were made possible by special teachers (P.E., music, library, art) taking responsibility for pupils and freeing the teachers. Often other priorities meant that teachers who might have shared curricular planning times could not be relieved simultaneously.

Desire, capacity, and conditions obviously interact. A series of successful meetings of a group of teachers, often with a supportive principal, was not only a necessary condition for planning, but it increased staff motivation as well as increased the capacity of the teachers to cope with challenges involved in carrying out the open arrangements.

We refrain from pressing specific recommendations based on the study. Some ideas are implicit in what has been reported; other ideas could be developed through discussion with specific districts or schools. Several general conclusions might be stated. First, schools of open physical design are most suited for open programs; if traditional programs are to be maintained, matters work out somewhat better if openness is modified. Secondly, if openness of program is selected, it should be recognized that persisting forces tend to push away from the open arrangement toward a simpler organization, to one less dependent upon cooperative, interlocking teacher effort. Counter efforts are required. Educators may not opt for open education; but if they do, serious and extended efforts are required to select and train teachers, to support and encourage their efforts, and to insure the conditions which enable open education.